

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

PLANETARY FABRY-PEROT SPECTROSCOPY

PERFORMING ORGANIZATION

JET PROPULSION LABORATORY
4800 OAK GROVE DRIVE
PASADENA, CA 91109

INVESTIGATOR'S NAME

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DESCRIPTION (a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)

- a. Application of high spectral resolution, Earth-based Fabry-Perot spectroscopy to the study of planetary atmospheres, for which current topics are outer planet HD and H₂ spectra (atmospheric structure, D/H ratio), Mars CO₂, CO, O₂, and H₂O spectra (atmospheric photochemistry), Venus H₂O and HDO (was Venus wet?), associated laboratory spectroscopy (especially H₂ overtone bands, HDO). Monochromatic CCD imaging photometry of the Jovian nebula, with images taken in rapid sequence among the diagnostic spectral lines of ionized sulfur species, providing self-supporting snapshots of the Jupiter/Io plasma conditions (spatially resolved electron and ion densities and temperatures), covering the post-Voyager period from 1981 and leading up to the Galileo tour in the early 1990s. High spectral resolution Fabry-Perot/CCD imaging of comets (OI, CI, and H₂O⁺ velocity maps and spatial distributions), and Io's charge exchanged neutral jet (direct probe of Io atmospheric structure).
- b. Development of data base analysis software to support microVAX-optical disk data archive for F-P/CCD images and planetary spectra. MicroVAX II/Alliant FX-1/Raster Technologies image processing hardware available. Jovian nebula images data base (1980-1986) compiled and data archived to optical disk. Analysis of simultaneous ground-based and IUE observations of Jovian nebula (1981-1985) initiated with T. Skinner. Analysis of Doppler-resolved image sequences (data cubes) of Io sodium neutrals to isolate diverse collision processes near Io, a sensitive probe of the physical interaction of the nebula and the neutral atmosphere of Io. Radiative transfer programs for outer planet spectral line formation ported to Alliant FX-1, with J. Bergstralh and H. Hammel.
- c. Analysis of existing data and development of data reduction techniques will continue. New observations focusing on the plasma interactions with the Io atmosphere will be carried out, at least in part in collaboration, with N. Schneider. Reduction of existing Jupiter/Io plasma data, with Caltech graduate student K. Stapelfeldt. Preparations will be made for Mars photochemistry observations, with D. Crisp. Laboratory spectroscopy of H₂ overtone bands at high spectral resolution are in progress, with data analysis to be carried out, with M. Mickelson and students. Modelling of Io atmosphere--neutral sodium phenomena, with H. Garrett. Completion of several papers (outer planet HD/H₂, outer planet H₂ profiles, Io atmosphere collision processes, Jovian nebula).
- d. None.

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OF POOR QUALITY